

CLAIMS:

1. A method of determining a hyperelliptic curve suitable for cryptographic purposes, comprising the steps of:
 - selecting a CM field K ,
 - determining a representant system of all isomorphism classes of simple principally polarized Abelian varieties having complex multiplication by the maximum order in K ,
 - determining period matrices associated with the representant system,
 - determining theta-nulls,
 - determining class polynomials for the CM field over a finite field F_q ,
 - determining a hyperelliptic curve over the finite field F_q and
 - specifying the group order n of the divisor class group of the hyperelliptic curve.
2. A method as claimed in claim 1, wherein the hyperelliptic curve is of genus 2.
3. A method as claimed in claim 1, wherein Igusa invariants are determined from the theta-nulls.
4. A method as claimed in claim 3, wherein the Igusa invariants are used to determine the class polynomials.
5. A method as claimed in claim 1, wherein Mestre invariants are determined from the theta-nulls.
6. A method as claimed in claim 5, wherein the Mestre method is used to generate the hyperelliptic curve over F_q .

7. A method as claimed in any of the foregoing claims, wherein a plurality of suitable CM fields K and the associated class polynomials are stored in accessible form and a CM field is selected from the plurality held in store to determine the hyperelliptic curve.
- 5 8. A method as claimed in any of the foregoing claims, wherein the period matrices are used in a Siegel-reduced form.
9. A method as claimed in any of the foregoing claims, wherein only six theta-nulls are determined.
- 10 10. A method as claimed in any of the foregoing claims, wherein, to determine the representant system, a test is not made to see whether the fundamental unit of the real subfield of the C_m field K is the norm of a unit of the CM field.
- 15 11. A method as claimed in any of the foregoing claims, wherein, to determine the representant system, a set of ideal classes is determined.
12. A method as claimed in claim 11, wherein pairs of mutually inverse ideal classes are identified and Igusa invariants are determined from the theta-nulls only once for
- 20 each pair.
13. A method as claimed in any of the foregoing claims, wherein q is a prime number p .
- 25 14. A method as claimed in claim 13, wherein the prime number p is selected such that each class polynomial has no more than h_k linear factors, where h_k is the class number of the CM field K .
15. A method as claimed in any of the foregoing claims, wherein the CM field is
- 30 selected such that the group order n of the divisor class group of the hyperelliptic curve is exactly prime.
16. A method as claimed in any of the foregoing claims, wherein q is the power of a prime number p .

17. A cryptographic method, wherein keys for encrypting data are determined from the group of F_q -rational numbers of a hyperelliptic curve that was generated by a method as claimed in any one of the foregoing claims.

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18. Cryptographic apparatus using a method according to one of the preceding claims.

19. Sender for sending a message, comprising a cryptographic apparatus for encrypting of messages according to claim 18.

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20. Receiver for receiving a message, comprising a cryptographic apparatus for decrypting of messages according to claim 18.